



US005761301A

## United States Patent [19]

Oshima et al.

[11] Patent Number: 5,761,301

[45] Date of Patent: Jun. 2, 1998

[54] MARK FORMING APPARATUS, METHOD OF FORMING LASER MARK ON OPTICAL DISK, REPRODUCING APPARATUS, OPTICAL DISK AND METHOD OF PRODUCING OPTICAL DISK

[75] Inventors: Mitsuaki Oshima, Kyoto; Yoshihiro Gotoh, Osaka, both of Japan

[73] Assignee: Matsushita Electric Industrial Co., Ltd., Osaka, Japan

[21] Appl. No.: 560,015

[22] Filed: Nov. 17, 1995

[30] Foreign Application Priority Data

Nov 17, 1994 [JP] Japan ..... 6-283415  
Feb. 2, 1995 [JP] Japan ..... 7-016153  
Oct 9, 1995 [JP] Japan ..... 7-261247

[51] Int. Cl. <sup>6</sup> H04K 1/00

[52] U.S. Cl. 380/4: 369/272; 235/494

[58] Field of Search 380/4; 369/272, 369/273, 286, 292, 52; 235/494

[56] References Cited

U.S. PATENT DOCUMENTS

5,065,429 11/1991 Lang ..... 380/25  
5,191,611 3/1993 Lang ..... 380/25  
5,392,351 2/1995 Hasebe et al. ..... 380/4  
5,400,403 3/1995 Fahn et al. ..... 380/21  
5,457,668 10/1995 Hibino et al. ..... 380/4  
5,457,746 10/1995 Dolphin ..... 380/4  
5,513,169 4/1996 Fite et al ..... 380/3

FOREIGN PATENT DOCUMENTS

0545472	6/1993	European Pat. Off. ....	380/4
553545	8/1993	European Pat. Off. ....	
4308680	10/1993	Germany .	
61-190734	8/1986	Japan .	
63-46541	2/1988	Japan .	
63-164043	7/1988	Japan .	
2-44448	2/1990	Japan .	
5-325193	1/1991	Japan ..... 380/4	
5-266576	10/1993	Japan .	
7-325712	12/1995	Japan .	
9101358	3/1993	Netherlands	

OTHER PUBLICATIONS

European Search Report dated May 15, 1997.  
International Search Report dated Jan. 30, 1996.

Primary Examiner—David C. Cain  
Attorney, Agent, or Firm—Ratner & Prestia

[57] ABSTRACT

An object of the present invention is to provide a marking forming apparatus, a method of forming a laser marking on an optical disk, a reproduction apparatus, an optical disk, and a method of manufacturing an optical disk, capable of providing a greatly improved copy prevention capability as compared to prior known construction. To achieve this object, in the optical disk of the invention, for example, a marking is formed by a laser on a reflective film of a disk holding data written thereon and at least position information of the marking or information concerning the position information is written on the disk in an encrypted form or with a digital signature appended thereto.

27 Claims, 43 Drawing Sheets

